LEACHATE AND RUNOFF SAMPLING AND ANALYSIS WORK PLAN

Prepared For:

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1.0 INTRODUCTION

This Leachate and Runoff Sampling and Analysis Work Plan describes a field investigation to be implemented by Hecla Mining Co. (Hecla) at a waste impoundment (referred to as Pond 2) located at the Apex site (site) in Washington County, Utah. This plan has been prepared by Shepherd Miller, Inc. (SMI) upon the request of Hecla to comply with the September 22, 1999 RCRA Order outlined below. This plan has been updated to address EPA comments on the January 20, 2000 version of the plan outlined in the August 2, 2000 EPA letter (EPA, 2000).

Pond 2 was used from approximately 1984 to 1995 for disposal of mineral beneficiation waste, waste from cobalt sulfate recovery operations and soil and liner materials from site cleanup operations; and subsequently for the disposal of consolidated waste materials removed from other impoundments at the Apex site. Pond 2 is synthetically-lined, approximately 500 feet in diameter and 30 feet deep. Pond 2 and the immediately surrounding area are fenced and encompass approximately eight acres. The Pond 2 liner was professionally installed, is comprised of blown asphalt, and is approximately one-quarter to one-half inch in thickness. Figure 1 depicts Pond 2 and the immediately surrounding area. Pond 2 background information is presented in Section 1.2.

1.1 EPA Order

Hecla received from EPA Region VIII, the *Order Requiring Monitoring, Testing, Analysis and Reporting issued pursuant to Section 3013 of RCRA, 42 U.S.C. § 6934, for the Hecla Pond, Shivwits Band Paiute Reservation, Washington County, Utah,* dated September 22, 1999 (the Order) (EPA, 1999), subsequent to an EPA RCRA compliance evaluation inspection conducted at Pond 2 in November 1998. The Order requires that Hecla prepare two documents: (1) a soil sampling and analysis work plan, and (2) a leachate and runoff sampling and analysis work plan.

This document comprises the second of the two work plans required by the Order. The field investigation described by this work plan is intended to satisfy the requirements set forth in Paragraphs 60 through 67 of the Order. The investigation, which will include sample collection and laboratory analysis of representative soil samples, is designed to ascertain the nature and

extent of any hazards to human health or the environment with respect to site-derived materials. The results of the investigation will be reported to EPA. The Soil Sampling and Analysis Work Plan is provided in a separate document (SMI, 2000).

1.2 Site Background

As described in SRK (1989) the site is underlain by up to 30 feet of silty sand soils of aeolian and colluvial origin. Beneath these soils are a sequence of siltstones and limestones (within the Triassic Moenkopi Formation) several hundred feet thick. Groundwater has been found in these fractured sedimentary rocks at a depth of 160 to 300 feet (SRK, 1984; Kleinfelder, 1995). This is the uppermost aquifer beneath the site, and provides makeup water for the operations at the site. Groundwater characterization wells (installed in 1983) show a gradient for groundwater flow from south to north.

As described in SRK (1989) surface water drainage in the site area is from south to north. Runoff flows toward the Pond 2 area from the south, but has been diverted around Pond 2. Runoff from the Pond 2 area flows to the north, but does not flow to the stock watering pond.

1.3 Operational Background

In 1984, the St. George Mining Company leased approximately 180 acres from the Shivwits Band of Paiute Indian Tribe and constructed a mill for extraction of gallium and germanium from copper ore from the nearby Apex Mine. The 180-acre leased area is referred to as the Apex site. From 1984 to 1988, tailings from the gallium and germanium extraction process were disposed of in Pond 2, as well as other impoundments at the site. Pond 2 was constructed with a perimeter embankment of on-site soil, with the pond bottom and inside embankment surfaces lined with a thick spray-on or blown asphalt liner. Several of the other ponds on site were constructed in the same manner using construction quality assurance procedures (SRK, 1989). At the end of St. George Mining Company's operation, there were eight synthetically-lined ponds containing various amounts of solutions and solids from the gallium and germanium extraction process (Ponds 1A, 1B, 1C, 3A, 3B, 2A, 2, and a surge pond).

Hecla purchased the operation from St. George Mining Company in March 1989 and continued the gallium and germanium extraction operation until 1990. During this period, Hecla used Pond 2 for disposal of mill tailings and Ponds 1A, 1B, and 3A for mill process solutions. No other ponds were used by Hecla. Following the shutdown of the gallium and germanium operation in 1990, Hecla conducted a cobalt-sulfate recovery process, also disposing of certain wastes from this operation in Pond 2 until September 1995.

In 1995, Hecla sold the operation to OMG Americas, Inc. (OMG), with the exception of the Pond 2 area retained by Hecla. OMG continues to operate a cobalt recovery process at the 180-acre site. Hecla entered into an Amendment to Lease with the Shivwits Band of Paiutes on September 25, 1995, for the purpose of leasing approximately eight acres of the original site (that includes Pond 2).

As part of the Purchase and Sale agreement, Hecla removed materials exceeding 80 parts per million for arsenic, lead and total petroleum hydrocarbons in and below the various ponds in accordance with protective soil cleanup standards established by Hecla and OMG. Hecla disposed of these materials in Pond 2. The excavated materials from the ore stockpile area were placed in the south end of Pond 2 (as shown in Figure 1). The materials within Ponds 1B, 1C, and 2A were trucked to Pond 2 and dumped from either the pond perimeter or the ore pad fill area. The materials within Ponds 3A and 3B were dredged and pumped as a slurry to Pond 2. Pond liner materials and subsoils were excavated and trucked to Pond 2 for disposal. Estimated volumes produced during Hecla operation and site cleanup are listed in the Order, based on Hecla data.

As part of the site cleanup work, the perimeter embankment of Pond 2 was raised approximately five feet with soils to provide sufficient freeboard for material disposal. The embankment was raised in a centerline manner, meaning that the centerline of the embankment raise was directly above the centerline of the original embankment.

1.4 Current Site Conditions

Waste materials in Pond 2 have been covered with borrow material, and Hecla has fenced the perimeter of the leased area (Figure 1). Following site cleanup work, the impoundment surface was leveled, covered, and preliminarily capped in a dome-shaped configuration using off-site borrow material. The Pond 2 surface was again domed in November 1998 and fine material from a commercial borrow pit was added to the cap at that time. The structure was also re-graded to eliminate surface depressions and pond water formation. The cap is a combination of rock and topsoil, averaging approximately three feet in thickness. The maximum material thickness beneath the cover is estimated to be approximately 30 feet.

Hecla manages a stormwater diversion ditch (constructed by OMG in 1998/99) as indicated on Figure 1. The ditch is graded in a southwesterly to northeasterly direction. Non-contact stormwater collects in the diversion ditch before it has any opportunity to reach the Pond 2 area and is conveyed away from the site toward an excavated area on OMG property.

Seepage was first observed by Hecla in 1997 on the southwest side of Pond 2. To intercept this seepage, Hecla constructed a synthetically-lined ditch that flows to a synthetically-lined evaporation pond on the southwest side of Pond 2 (Evaporation Pond 1).

In November 1998, Hecla constructed a second evaporation pond (Evaporation Pond 2) to increase the holding and evaporation capacity of the seepage water from Pond 2. At the same time a berm and ditch were constructed to divert up-gradient stormwater runoff from collecting in the evaporation pond area. During the summer of 1999, water from Evaporation Pond 1 was transferred via a portable pump to the newly constructed Evaporation Pond 2.

Hecla made additional modifications to the decant/evaporation system in January 2000. A pit was excavated on top of the Pond 2 into which Hecla transferred the material, water, and liner from Evaporation Pond 2. The Evaporation Pond 2 area was then backfilled with borrow material. The channel to Evaporation Pond 1 was also excavated, and the material placed in Pond 2. The pit was then covered and leveled. A new, wider collection ditch (approximately 5 feet wide, 80 feet long, and 1 foot deep) was constructed, and Pond 2 was newly excavated and

lined in the same general vicinity.. Evaporation Ponds 1 and 2 are located at the southwest corner of Pond 2, and both were constructed using UV resistant polyvinyl chloride (PVC) liner material. Evaporation Pond 1 is approximately 10 feet wide, 80 feet long, and 2 feet deep; Evaporation Pond 2 is approximately 8 feet wide, 80 feet long, and 3 feet deep.

An additional area of potential seepage (typically a moist area) was observed in 1997 on the east side of Pond 2. This area has dried out since 1997.

2.0 LEACHATE AND RUNOFF SAMPLING AND ANALYSIS

2.1 Objective

The objective of the leachate and runoff sampling and analysis is to ascertain the nature and extent of contaminated leachate and runoff flowing from portions of Pond 2 adjacent to and downgradient from Pond 2. This information may be used to: (1) characterize the potential pathways of migration of any contaminants detected, (2) characterize the sources of contaminants, (3) define the degree and extent of contaminated materials, and (4) identify actual or potential receptors. A single sampling event is anticipated to achieve these objectives. If analytical results generated are not sufficient to meet certain objectives, this work plan will be revised in accordance with further discussions between Hecla and EPA.

A health and safety plan (HASP) has been prepared and is included as Attachment B to this document. The HASP presents the human health and safety requirements and guidelines for performance of work conducted pursuant to the work plans for the site.

2.2 Sampling Locations

Proposed locations for leachate and runoff sampling are shown in Figure 1. These locations are: (1) the lined collection ditch that runs from the seep on the west side of Pond 2 to the lined evaporation ponds, and (2) the two lined evaporation ponds. If flow is present, samples will be collected at the seepage area on the east side of Pond 2 and from the diversion ditch along the east side of Pond 2, both upgradient and downgradient of Pond 2. Flow measurements will be made at sampling locations where flow is present. However, flow is not observed at these locations, small holes will be dug in the seepage area. If liquid collects in the holes within a 24 hour period, samples will be collected.

2.3 Sampling Methods

Leachate and runoff samples will be collected according to methods described in Standard Operating Procedure (SOP) No. 1. Flow measurement will be done according to procedures

described in SOP No. 2. Additionally, decontamination procedures described in SOP No. 4 will be used during sampling. These SOPs are included in Attachment C to this work plan.

2.4 Sample Analysis

Leachate and runoff samples will be laboratory analyzed for the parameters listed in Table 1. The laboratory will be selected based on Utah certification and participation in quality assurance/quality control programs equivalent to those followed by EPA. If requested, sample splits or duplicated samples will be provided to EPA, the Lessor or others at EPA discretion in the field at the time of sample collection. At the time of sample collection, both pH and conductivity will be measured in the field according to procedures described in SOP No. 1. A visual description of turbidity will be made at the time of sampling.

2.5 Quality Assurance

All sampling activities will be performed in a manner consistent with EPA Region VIII's Field Sampling Guide, and the QA/R-5 (EPA, 1996, 1998). Quality assurance methods are described in the Quality Assurance Project Plan (QAPP) included as Attachment A to this work plan. Field quality control (QC) methods related to water chemistry data include collection of blank, equipment rinsate, and duplicate samples, each to be collected at a rate of 1 for every 20 primary samples collected. If less than 20 samples are collected, at least one field duplicate, one field blank, and one field rinsate will be collected. Field QC sample collection procedures are described in SOP No. 1.

3.0 SCHEDULE

According to Paragraph No. 70 of the EPA Order, Hecla is required to implement the work plan within 10 days following EPA approval (or approval with modification) of the work plan. This work plan will be implemented in conjunction with the Soil Sampling and Analysis Work Plan (SMI, 2000). Implementation will include final contracting and scheduling of the drilling or excavation subcontractors associated with the Soil Sampling and Analysis Work Plan. Hecla will notify the EPA, Tribal, and BIA representatives identified in Paragraph Nos. 65 and 66 of the Order in writing within 10 calendar days before engaging in any field activities at the Apex site.

As described in Paragraph No. 64 of the EPA Order, Hecla will submit to EPA a final report within 45 days of work completion. Work completion will consist of final approval of laboratory analyses (following data validation). As required by the EPA Order, the report will define the nature, location, extent, direction, and rate of movement of any constituents identified at or as having been released from the facility.

4.0 REFERENCES

Shepherd Miller, Inc. (SMI), 2000. Soil Sampling and Analysis Work Plan, prepared for Hecla Mining Company, September 18.

U.S. Environmental Protection Agency (EPA), 1996. *EPA Region VIII Minimum Requirements for Field Sampling Activities.* U.S. Environmental Protection Agency, Technical and Management Services, Denver, Colorado, September.

U.S. Environmental Protection Agency (EPA), 1998. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operation.* QA/R-5, U.S. Environmental Protection Agency Quality Assurance Division, External Review Draft Final, October.

U.S. Environmental Protection Agency (EPA), 1999. Order Requiring Monitoring, Testing, Analysis and Reporting. United States Environmental Protection Agency, Region VIII. RCRA Docket. Proceeding Under Section 3013 of the Resource Conservation and Recovery Act, 42 U.S.C. § 6934, Docket No.: RCRA-8-99-06, September.

U.S. Environmental Protection Agency (EPA), 2000. Letter Concerning Comments on Soil Sampling and Analysis Work Plan and Leachate and Run-Off Sampling and Analysis Work Plan, addressed to Hecla Mining Company, August 2.

Table 1 Leachate and Runoff Sample Parameters, Methods, and Detection Limits for Laboratory Analysis

Constituent	Method	Detection Limit (mg/L unless noted)
Arsenic	206.2	0.001
Barium	200.7	0.002
Cadmium	200.7	0.0024
Chromium	200.7	0.005
Mercury	245.1	0.0002
Lead	239.2	0.001
Selenium	270.2	0.001
Silver	200.7	0.006
Cobalt	200.7	0.005
Copper	200.7	0.003
Iron	200.7	0.020
Manganese	200.7	0.002
Nickel	200.7	0.023
Sodium	200.7	0.088
Tungsten	200.7T	0.020
Zinc	200.7	0.003
Calcium	200.7	0.013
Sulfate	300.0	0.3
Chloride	300.0	0.2
Ammonia	350.3 ISe	0.1
Nitrate	300.0 IC	0.05
Nitrate + Nitrite	353.2	0.02
TPH - Gasoline	8015M	0.010
TPH - Kerosene	8015M	0.2
TPH - BTEX	8015M	0.001
TSS	160.2	0.1
Halogenated Volatile Organics	601/8010	0.0005 – 0.002
Semivolatile Organics	601/8010	
Gross alpha	900.0	1 pCi/l
Gross beta	900.0	1 pCi/l

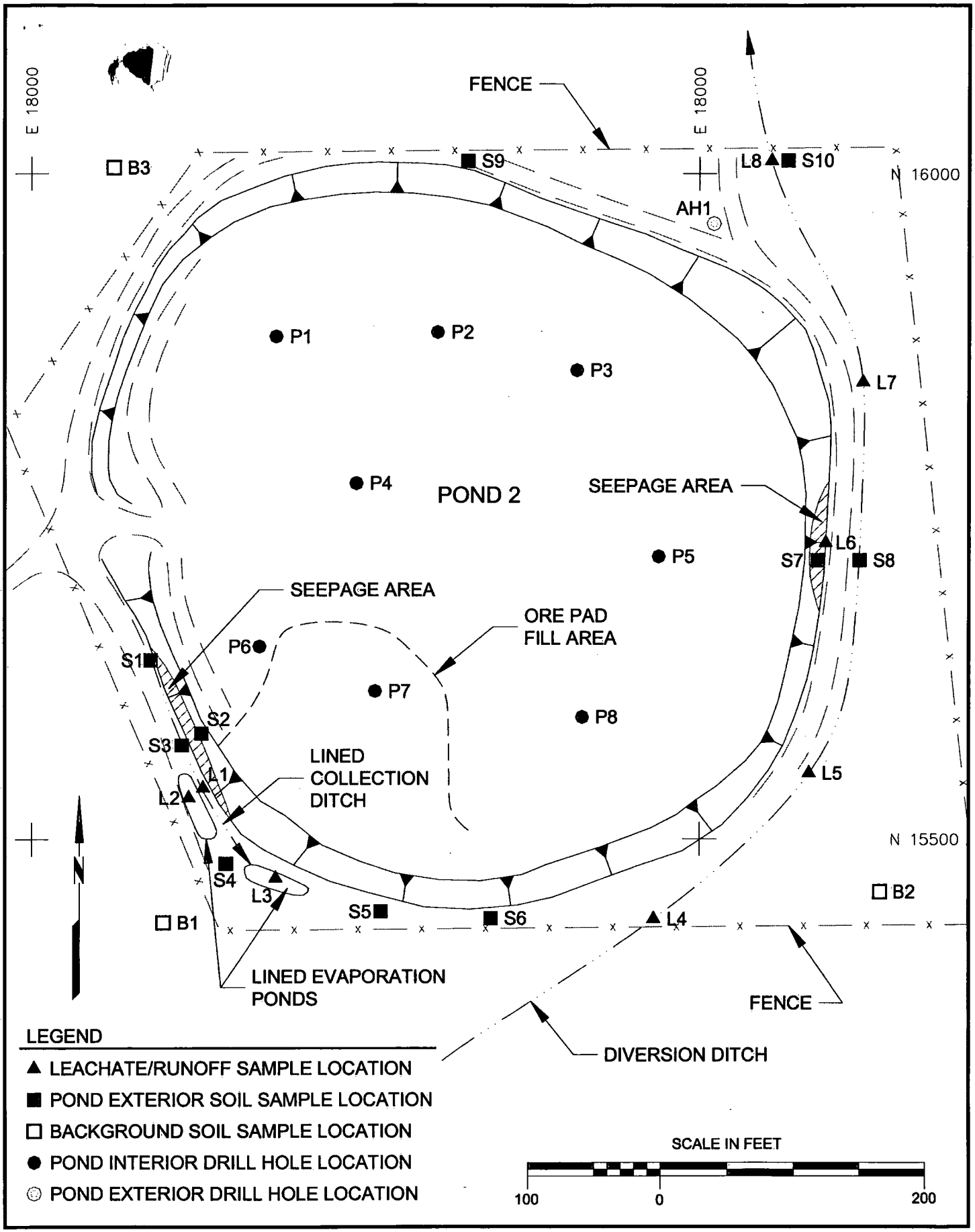

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FIGURE 1
POND 2
SAMPLING LOCATIONS

Date:	SEPTEMBER 2000
Project:	100551
File:	SAMPLE-1.DWG